**Unit 1 Cluster 4 (A.APR.1): Polynomials**

Cluster 4: Perform arithmetic operations on polynomials

1.4.1 Polynomials are closed under addition, subtraction, and multiplication

1.4.1 Add, subtract, and multiply polynomials (**NO DIVISION**)

|  |
| --- |
| **VOCABULARY**  A term that does not have a variable is called a **constant.** For example the number 5 is a **constant** because it does not have a variable attached and will always have the value of 5.  A constant or a variable or a product of a constant and a variable is called a **term**. For example 2, , or are all terms.  Terms with the same variable to the same power are **like terms**.  and  are like terms.  An expression formed by adding a finite number of unlike terms is called a **polynomial**. The variables can only be raised to positive integer exponents.is a polynomial, while is not a polynomial. **NOTE:** There are no square roots of variables, no fractional powers, and no variables in the denominator of any fractions.  A polynomial with only one term is called a **monomial**. A polynomial with two terms is called a **binomial (**). A polynomial with three terms is called a **trinomial****.**  Polynomials are in **standard (general) form** when written with exponents in descending order and the constant term last. For example is in standard form.  The exponent of a term gives you the **degree** of the term. The term has degree two. For a polynomial, the value of the *largest exponent* is the **degree** of the whole polynomial. The polynomial  has degree 4.  The number part of a term is called the **coefficient** when the term contains a variable and a number.  has a coefficient of 6 and has a coefficient of -1.  The **leading coefficient** is the coefficient of the first term when the polynomial is written in standard form. 2 is the leading coefficient of . |

Degree *n*

General Polynomial: 

Leading Coefficient 

Leading Term

Constant

**CLASSIFICATIONS OF POLYNOMIALS**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Form | Degree | Example |
| Zero |  | None |  |
| Constant |  | 0 |  |
| Linear |  | 1 |  |
| Quadratic |  | 2 |  |
| Cubic |  | 3 |  |

**Practice Exercises A:**

Determine which of the following are polynomial functions. If the function is a polynomial, state the degree and leading coefficient. If it is not, explain why.

1. 

2. 

3. 

4. 

5. 

6. 

**Operations of Polynomials**

**Addition/Subtraction: Combine like terms.**

Example 1:

|  |  |
| --- | --- |
| Horizontal Method | Vertical Method |

Example 2:

|  |  |
| --- | --- |
| Horizontal Method    =  = | Vertical Method |

**Multiplication: Multiply by a monomial**

Example 3:





Example 4:



**Multiplication: Multiply two binomials** 

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Distributive (FOIL) Method | Box Method   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | | 9 |  |  |   *\*combine terms on the diagonals of the unshaded boxes(top right to lower left)* | Vertical Method |

**Multiplication: Multiply a binomial and a trinomial** 

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Distributive Method | Box Method   |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  | |  |  |  |  |   *\*combine terms on the diagonals of the unshaded boxes(top right to lower left)* | Vertical Method |

**Practice Exercises B:**

Perform the required operations. Write your answers in standard form and determine if the result is a polynomial.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 
13. 
14. 
15. 
16. 
17. 
18. 
19. 
20. 

**YOU DECIDE**

Are polynomials closed under addition, subtraction, multiplication? Justify your conclusion using the method of your choice.